REMARKS

There were 67 claims originally filed. In accordance with the telephone conversation between the Examiner and Philip Conrad on 6/5/03, Applicants acknowledge that the claims to invention I have been elected (i.e., claims 1-54). Claims 55-67, which pertain to inventions II and III, have been cancelled. New claim 68 has been added. As claim 68 depends upon 37, it is believed that claim 68 is properly includable with elected Group I. Each of the currently listed inventors has contributed to at least one of the remaining claims.

The Examiner has objected to the disclosure, alleging there is no description of Figures 4 and 5. The disclosure, and in particular paragraph [0033], has been amended to correct this informality. Support for the amendment describing Figures 4 and 5 is found in the Brief Description of the Figures and in originally filed Figs. 3, 4 and 5.

Claims 1-54 have been rejected under 35 U.S. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. To obviate the rejection, the claims have been amended as follows: claims 1, 22 and 37 have been amended to specify that the first laser is attached/located such that it "is substantially aligned with said optical component", claim 4 has been amended to correct the dependency from claim 1 to claim 3 and to provide proper antecedent basis for the term "said fiber bonding pad", and claims 1 and 22 have been amended to clarify that the laser

attached to the laser submount is the "first laser". Examples of support for the amendments to claims 1, 22, and 37 can be found in originally filed claim 1 and on page 3, paragraph [0006]. With respect to claims 7, 8, 14, 24, 25, 31, 40, 41 and 47, Applicants submit that these claims do particularly point out and distinctly claim the subject matter that Applicants regard as their invention.

In particular, claims 7, 24, and 40 define a fiber bonding pad that includes a first and a second layer, claims 8, 25, and 41 specify that the fiber bonding pad also includes a third layer, while claims 14, 31, and 47 specify that the fiber bonding pad also includes a fourth layer. One of ordinary skill in the art will appreciate that the composition of each of the layers is selected in dependence upon the desired properties (e.g. selecting the first layer to be gold or a similar material provides an appropriate solder wetting layer as indicated in paragraph [0032]).

Claims 1-54 have been rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 5,307,434 (Blonder et al) in view of United States Patent No. 6,205,364, (Jin et al) or United States Patent No. 6,271,049 (Auracher et al). Reconsideration of this rejection is respectfully requested.

With respect to claims 1 and 22, it is submitted that the combination of teachings of Blonder et al and Auracher et al does not provide "an optical connection module having a fiber submount attached to a substrate *and* a laser submount attached to said substrate". More specifically, Blonder et al show

the laser being mounted directly to a substrate via one or more layers, whereas Auracher et al show the laser and the optical component both attached to a same submount (i.e. in contrast to the instant invention as defined in claims 1 and 22, wherein there are two separate submounts mounted to the substrate - namely, a fiber submount and a laser submount). While the Examiner suggests that the multi-layer metalization layer 14 of Blonder et al can be characterized as a submount, Applicants respectfully submit that that the multi-layer 14 in Blonder et al and the gold layer 13 in Auracher et al function similar to the bonding region 44 of the instant invention and do not serve as a submount. In fact, at column 1, lines 64-65 Blonder et al disclose that their invention advantageously uses a unitary substrate body, and at column 2, lines 5-7, that the semiconductor laser is attached to the surface of the unitary substrate body (typically by means of solder). This is direct contrast to the instant invention, wherein the semiconductor laser is attached to a submount that is attached to a substrate.

Although the combination of teachings of Blonder et al and Jin et al, may appear to provide an optical connection module having a laser submount, Applicants submit that it would not be obvious to include the laser submount taught by Jin et al in the laser 13 of Blonder et al for the purpose of thermal management, since Blonder et al provides appropriate thermal management without a submount. At column 3, lines 1-14, Blonder et al specifies that the laser should be bonded directly, without an intervening dielectric layer, to the Si substrate to facilitate heat transfer from the laser to the substrate. Providing a laser submount to the laser/fiber mount of Blonder et al (e.g., in the absence of a thermal insulating fiber submount as disclosed in the instant

invention) would only complicate the design and mechanics of Blonder et al's laser/fiber mount, and would not provide any additional advantages.

Applicants further submit that the combination of the teachings of Blonder et al and Auracher et al, and/or Blonder et al and Jin et al, do not teach using a "fiber submount that is attached to said substrate and that includes a thermally insulating material having a thickness greater than 20 micrometers", as defined in currently amended claims 1 and 22. Blonder et al and Auracher et al both specify the use of a thermal insulation layer; however, Blonder et al specify that the thermal insulation layer has a thickness of 20 microns, while Auracher et al does not specify the thickness of the thermal insulation layer (i.e. they do not teach that the thermally insulating material must be greater than 20 micrometers). In fact, in both references, the thermal insulation layer appears to be sufficiently thin to allow alignment when the laser is mounted directly to the same substrate/submount to which the thermal insulation layer is formed (i.e. a laser mount is unnecessary and unwanted). While it is true that increasing the thickness of the thermal insulation layer would increase the level of thermal insulation provided, Applicants submit that it would not be obvious to do so in the systems taught by Blonder et al and/or Auracher et al because it would complicate the design, mechanical structure, and alignment.

Further with respect to claims 1 and 22, it is submitted that the combination of the teachings of Blonder et al and Jin et al, and/or the combination of the teachings of Blonder et al

and Auracher et al, do not provide an optical connection module that includes the combination of an optical component soldered to a substrate via a fiber submount including a thermally insulating material having a thickness greater than 20 micrometers *and* a first laser that is attached to the substrate via a laser submount.

Applicants believe that the combination of a fiber submount including a thermally insulating material having a thickness greater than 20 microns and a laser submount, as defined in currently amended claims 1 and 22, provides a novel and inventive structure. In particular, the use of a fiber submount including a thermally insulating material having a thickness greater than 20 microns provides high thermal insulation, which for example, is sufficient to minimize temperature increase of the first laser during the laser soldering as discussed at page 12, paragraph [0040]. The use of the laser submount compensates for the height of the fiber submount and the relatively thick thermally insulating material so as to maintain optical alignment between the laser and the optical component (see for example Fig. 2).

In view of the above arguments Applicants respectfully submit that claims 1 and 22, and accordingly claims 2-21 and claims 22-36, which depend from claims 1 and 22, respectively, are in allowable form.

With respect to claim 37, it is submitted that neither the combination of the teachings of Blonder et al and Jin et al, nor the combination of the teachings of Blonder et al and

Auracher et al, provide an optical connection module including a thermally insulating material *formed integrally in* a substrate and having a thickness greater than 20 micrometers.

In fact, it is submitted that none of the references cited teach that the insulating material is *formed integrally in* the substrate. At column 2, lines 59-68, and at column 4, lines 29-34, Blonder et al teach that the SiO2 layer is *formed on* the Si substrate using a conventional process, such as high pressure oxidation in steam. In Figs. 1 and 2, and at column 4, lines 1-7 and 40-50, Jin et al teach that the support elements 14, 17, 20, are *formed on* the substrate 18. In Figs. 1 and 2, and at column 2, lines 46-55, Auracher et al teaches using a thermal insulation layer that is applied to the semiconductor wafer (i.e., on the surface).

Applicants submit that providing a thermally insulating material *formed integrally in* a substrate, as shown for example in Fig. 7A, and discussed in paragraphs [00035], [00036], and [0037], is novel and inventive. In particular, the integrated structure provides modules with the unforeseen advantage of excellent planarity (see end of paragraph [0039]) and relatively low cost fabrication (see end of paragraph [0040]). Moreover, the integrated structures allow the production of relatively thick isolation layers, which for example are greater than 20 micrometers (see end of paragraph [0036]).

Applicants further submit that modules wherein said thermally insulating material is attached to said substrate using anodic

bonding, as defined in claim 51, wherein at least one lateral gap is formed between said substrate and said thermally insulating material and filled with glass frit, as defined in claim 52, wherein said glass frit is annealed and polished, as defined in claim 53, and wherein said thermally insulating material is formed using flame hydrolysis, as defined in claim 54, are novel and inventive. As described at the end of paragraphs [0036], [0037], and [0039], respectively, anodic bonding allows the integration of relatively thick thermally insulating material with the substrate; annealing and polishing glass frit filling a lateral gap between the substrate and insulating material provides a planar and smooth surface; and forming the thermally insulating material using flame hydrolysis provides a void-free adhesion and excellent planarity. None of the cited references teach these features in an optical connection module, and hence the combination of their teachings does not teach these features.

Accordingly, Applicants submit that claims 37, 51, 52, 53, and 54 are in allowable form, and that claims 38-54, which depend from believed allowable claim 37 are also in allowable form.

Reconsideration of the rejection of claims 1-54 under 35 U.S.C. 103(a) as being unpatentable over Blonder et al in view of Jin et al or Auracher et al is further requested for the following reasons: (1) neither Blonder et al nor Auracher et al provide a motivation to combine the two references, and (2) neither Blonder et al nor Jin et al provides a motivation to combine these two references.

In fact, it is submitted that Blonder et al teach away from the instant invention by providing a unitary substrate. At column 1, lines 28-34, Blonder et al teach that the prior art disadvantageously uses a multiplicity of piece parts, which frequently includes a variety of materials. They state that such designs are typically relatively difficult to assemble, require maintenance of close tolerances, and tend to be subject to thermal drift. Accordingly, Blonder et al propose a transmitter that comprises a unitary substrate body (see column 1, lines 64-65). This is in direct contrast to the instant invention as defined in claims 1 and 22, wherein the optical connection module comprises a fiber submount and a laser submount, both of which are attached to a substrate (i.e. a multi-part construction).

It is further submitted that Jin et al teach away from the instant invention by suggesting at column 4, lines 1-6 and 40-50 that that the support element 14, 20 (e.g. a submount) can be manufactured from thermally conducting materials such as metal/alloys, silicon, or other semiconductor substrates. This is in direct contrast to the instant invention wherein the submount includes a thermally insulating material (for example, see claims 1, 22, and 37).

The Office Action also rejects claims 1, 2 and 16-21 under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al in view of Jin et al or Auracher et al. Reconsideration of this rejection is respectfully requested.

Sakaguchi et al disclose a fiber-coupled laser optical connection module for attaching an optical component to a substrate and aligning the optical component with a laser. The module includes a substrate, a fiber submount made of silica glass, an optical component, a laser submount, and a laser. Sakaguchi et al do not teach using heat from a second laser to solder the optical component to the fiber submount, as defined in currently amended claim 1.

Applicants submit that it is not appropriate to combine the teachings of Sakguchi with the teachings of either Jin et al or Auracher et al, because Sakguchi et al teach away from the instant invention as defined in claim 1. More specifically, at column 4, lines 66-68, and column 5, line 1, Sakagucki et al specify that "the solder is melted by heating the coupling system *as a whole*". Heating the coupling system as a whole defeats the unforeseen advantages of providing a fiber submount having a thermally insulating material with a thickness greater than 20 micrometers and an optical component that is soldered to said fiber submount using heat from a second laser, as defined in currently amended claim 1. For example, one unforeseen advantage is that the resulting optical connection module includes an insulating portion to protect the first laser from heat from the second laser. Heating the coupling system as a whole would damage the first laser, in direct contrast to the instant invention.

Accordingly, it is submitted that claim 1, and claims 2, 16-21, which depend from claim 1 are in allowable form.

Claim 22 has been amended for grammatical purposes (i.e., to correct "a" to -- an--). Claims 8, 9 and 10 have been amended to correct the term "the laser module" to -- the optical connection module--. Additional minor amendments have been made to several of the claims to place them in a more grammatically and idiomatically correct form.

New claim 68 has been added. An example of support for new claim 68 can be found in paragraph [0038], wherein it is specified that the thermally insulating material is formed integrally in said substrate by patterning and etching a first region of the substrate.

As such, it is respectfully submitted that all of the claims remaining in the application are in condition for allowance. Early and favorable consideration would be appreciated.

Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

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Respectfully submitted,

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